## CLAIMS

What is claimed is:

1. A system storing and using a compressible gas in the dense phase under pressure to generate energy, the system comprising:

one or more pipes of a material which will withstand a predetermined range of temperatures and meet required design factors for the pipe material;

a chilling member cooling the gas to a temperature within said temperature range;

a pressurizing member pressurizing the gas within a predetermined range of pressures at a lower temperature of said temperature range where the compressibility factor of the gas is at a minimum;

said chilling member and pressurizing member setting the temperature and pressure of the gas to maximize the compression ratio; and

a turbine generating energy; and

said turbine consuming gas stored in said pipes.

2. The system of claim 1 wherein said pipes material is either X-80 or X-60 premium high strength steel and said temperature range is between -20°F and 0°F.

3. The system of claim 2 wherein said lower temperature is substantially -20°F.

4. The system of claim 3 wherein the gas has a specific gravity of about 0.6 and said pressure range is between 1800 and 1900 pounds per square inch.

5. The system of claim 3 wherein the gas has a specific gravity of about 0.7 and said pressure range is between 1300 and 1400 pounds per square inch.

6. The system of claim 1 wherein said pipe is made of X-100 premium high strength steel and said temperature range is between -40°F and 0°F.

7. The system of claim 4 wherein said lower temperature is substantially -40°F.

8. The system of claim 1 wherein said pressure range is that range of pressures at said lower temperature where the compressibility factor varies no more than 2% of the minimum compressibility factor.

9. The system of claim 1 wherein there are a plurality of pipes connected by one or more manifolds.

10. The system of claim 1 wherein the pipe material is steel and one required design factor is 0.5 of the yield strength of steel pipe.

11. The system of claim 1 wherein said pipe is made of steel and further including maximizing the ratio of the mass of the stored gas to the mass of said steel pipe.

12. The system of claim 11 wherein the pipe diameter and pipe wall thickness are chosen to maximize the ratio of masses.

13. The system of claim 12 wherein the gas has a specific gravity of substantially 0.6 and wherein one required design factor is 0.5 of the yield strength of the steel pipe, the steel pipe has a yield strength of 80,000 psi, the pipe diameter is 20 inches, and the pipe wall thickness is between 0.43 and 0.44 inches.

14. The system of claim 12 wherein the gas has a specific gravity of substantially 0.6 and wherein one required design factor is 0.5 of the yield strength of the steel pipe, the steel pipe has a yield strength of 80,000 psi, the pipe diameter is 36 inches and the pipe wall thickness is between 0.78 and 0.79 inches.

15. The system of claim 12 wherein the gas has a specific gravity of substantially 0.7 and wherein one required design factor is 0.5 of the yield strength of the steel pipe, the steel pipe has a yield strength of 80,000 psi, the pipe diameter is 24 inches and the pipe wall thickness is between 0.38 and 0.39 inches.

16. The system of claim 12 wherein the gas has a specific gravity of substantially 0.7 and wherein one required design factor is 0.5 of the yield strength of the steel pipe, the steel pipe has a yield strength of 80,000 psi, the pipe diameter is 36 inches and the pipe wall thickness is between 0.58 and 0.59 inches.

17. A system for storing and transporting gas comprising

a vehicle; and

a gas storage system disposed on said vehicle and designed to minimize the compressibility factor of the gas and

maximize the ratio of the mass of the gas to the mass of the storage system.

18. The system of claim 17 wherein said gas storage system is designed for a single specific gravity and further comprising a reservoir of hydrocarbons available to adjust the specific gravity of the transported gas to the desired value.

19. The system of claim 17 wherein said vehicle is specially constructed for use in transporting gas and the gas storage system is constructed integral to the vehicle as the vehicle is being constructed.

20. The system of claim 17 wherein said gas storage system comprises:

a plurality of pipes arranged in tiers;

insulation for insulating said pipes to maintain a reduced temperature;

a system for loading and unloading gas from said pipes;

a manifold system connecting said pipes to said loading and unloading system; and

a structural frame to support said pipes.

21. The system of claim 20 wherein said pipes are 20 inches in diameter.

22. The system of claim 20 wherein said insulation comprises a nitrogen atmosphere surrounding said pipes.

23. The system of claim 20 wherein said structural frame is constructed from I-beams fixably attached to the carriage of said vehicle and provides structural support to the vehicle.

24. The system of claim 23 wherein said I-beams are placed between each tier of pipe and welded together.

25. The system of claim 20 wherein said insulation comprises a polyurethane foam at least 12 inches thick.

26. The system of claim 20 wherein said structural frame is constructed from thin straps formed from steel plate to conform to the outside diameter of said pipes, wherein said straps are placed between tiers of pipe and fastened to straps on adjacent tiers.

27. The system of claim 26 wherein said pipes are not fastened to said straps.

28. The system of claim 20 wherein said manifold system comprises:

a valve and a pressure gauge attached to the manifold; and

a piping system at each end of said pipes to divide said pipes into groups to facilitate the loading and unloading of gas.

29. The system of claim 28 wherein said piping system comprises a manifold for each horizontal tier of pipes, each horizontal manifold being connected to a master vertical manifold.

30. The system of claim 17 further including a conduit communicating a reservoir of hydrocarbons with the natural gas to be stored in said pipes for adding hydrocarbons to said natural gas in such an amount such that the resultant gas to be stored in the pipes has a predetermined specific gravity.

31. A train car for transporting compressed natural gas comprising:

a carriage;

an enclosure having a support structure forming a part of said carriage;

a plurality of pipes forming a portion of said support structure; and

said pipes forming a storage container for the compressed natural gas.

32. The train car of claim 31 wherein said support structure includes structural members extending across the beam of the carriage and supporting said pipes.

33. The vehicle of claim 32 wherein said structural members include saddles receiving upper and lower sides of said pipes.

34. The vehicle of claim 33 wherein said enclosure includes a nitrogen atmosphere.

35. The vehicle of claim 31 further including manifolds and valving connected to the ends of said pipe.

36. The vehicle of claim 31 further including insulation around said plurality of pipes.

37. The vehicle of claim 31 further including a smart pig disposed in said pipes for testing said pipes.

38. A modular system for storing gas comprising:

a plurality of pipes arranged in tiers;

a means for insulating said pipes to maintain a reduced temperature;

a system for loading and unloading gas from said pipes;

a manifold system connecting said pipes to said loading and unloading system;

a structural frame to support said pipes; and

an outer enclosure.

39. The modular system of claim 38 wherein said pipes are arranged vertically.

40. A storage system for gas comprising:

a plurality of pipes in parallel relationship forming a plurality of tiers of pipes;

a plurality of support members extending between adjacent tiers of pipe and having opposing accurate recesses for housing individual pipes;

said pipes and support members forming a pipe bundle;

manifolds and valves connecting the ends of said pipe; and

insulation surrounding said pipe bundle.

41. The system of claim 40 further including liners between said support members and said pipes.

42. The system of claim 40 wherein said pipe is welded to said support members.

43. The system of claim 40 wherein said pipe is welded to said support members at warmer temperatures than the gas storage temperature whereby the resulting strain is taken in said pipe.

44. The system of claim 40 wherein said pipes are clamped between said support members.

45. The system of claim 40 wherein said pipes may expand and contract longitudinally between said support members.

46. The system of claim 40 wherein said support members are straps of steel plate bent to conform to the outside curvature of adjacent tiers of pipe.

47. The system of claim 40 wherein an interlocked structure is formed such that Poisson's ratio of the pipe bundle approaches one.

48. The system of claim 40 further including a low-friction or anti-erosion material between said pipes and said straps.

49. The system of claim 40 wherein the ends of said straps are connected to an enclosure for said pipe bundle.

50. The system of claim 49 wherein said individual pipes are allowed to move independently in response to the movement of said enclosure.

51. The system of claim 40 wherein said manifolds close each end of said pipe and includes tier manifolds communicating the interior of said pipes with master manifolds for loading and unloading the gas stored in said pipes.

52. The system of claim 40 wherein said valves include flow control members between said pipe ends and said tier manifolds and between said tier manifold and said master manifolds.

53. The system of claim 40 further including a frame forming an enclosure around said pipe bundle.

54. The system of claim 53 further including filling the enclosure with a nitrogen atmosphere.

55. The system of claim 54 further including means for circulating the nitrogen around the pipes within the enclosure.

56. The system of claim 53 wherein said enclosure is formed by a flexible, insulating skin of panels or a semi-rigid, multi-layered membrane.

57. The system of claim 56 wherein said enclosure may be inflated with nitrogen.

58. The system of claim 40 wherein said pipes may be either vertical or horizontal with the ground.

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59. A system for the storage and transport of compressed natural gas, the system comprising:

a vehicle with a carriage;

a plurality of pipes in parallel relationship;

a support structure including support members extending between rows of pipe and a frame forming an enclosure around said pipes;

said pipes and support structure forming a modular unit; and

said modular unit being disposed on said carriage.

60. The system of claim 59 wherein said pipes are perpendicular to said carriage.

61. The system of claim 59 wherein said modular unit has a tilted orientation to said carriage for off-loading the stored gas.

62. The system of claim 59 wherein said modular unit may be loaded and unloaded from said vehicle.

63. A system for transporting natural gas comprising:

a source of natural gas;

a loading station capable of compressing and chilling the gas;

a vehicle for transporting the gas in a gas storage system at a pressure and temperature that minimizes the compressibility factor of the gas and maximizes the compression ratio of the gas; and

a receiving station.

64. The system of claim 63 wherein said receiving station comprises a surge storage system to receive the gas.

65. The system of claim 64 wherein the surge storage system has sufficient capacity to fill the demand of customers until gas from another vehicle is off-loaded.

66. The system of claim 63 wherein said receiving station comprises a supply of displacement fluid to off-load the gas.

67. The system of claim 63 wherein said receiving station comprises a means for storing gas in periods of low usage to be used in periods of high usage.

68. A method of supplying gas from a source that supplies gas at a variable rate to a consumer that uses gas at a constant rate comprising:

loading gas into a gas storage apparatus when the rate of gas supply exceeds the rate of gas use;

maintaining gas in the gas storage apparatus when the rate of gas supply equals the rate of gas use; and

off-loading gas from the gas storage apparatus when the rate of gas use exceeds the rate of gas supply;

cooling and pressurizing the gas to a supercritical gas for storage; and

maintaining the gas in this condition until off-loading, the gas storage apparatus being constructed to maximize the ratio between the mass of gas stored and the mass of the gas storage apparatus.

69. An apparatus for testing a well comprising:

a production module to control the flow of product from the well and separate the product into gaseous and liquid products;

means for storing liquid product;

a gas storage apparatus; and

cooling and pressurizing the gas to a supercritical gas for storage and maintaining the gas in this condition by the gas storage apparatus.

70. An apparatus for supplying gas to a power plant, the apparatus comprising:

a plurality of pipes, each pipe having a central axis and a first and second end, said pipes being arranged so that their central axes are parallel and said first ends are located on a first plane and said second ends are located on a second plane;

said pipes storing the gas at a reduced temperature and pressure as a supercritical gas.

a first manifold system attached to each of said first ends of said pipes for loading the gas into said pipes;

a second manifold system attached to each of said second ends of said pipes for off-loading the gas from said pipes to the power plant;

a structural system to support said plurality of pipes;

an insulation system to minimize heat transfer between the pipes and the environment; and

an outer housing surrounding the apparatus.